

Appl. S.N. 10/673,762
Arndt. dated August 9, 2006
Reply to Office Action of May 9, 2006
Docket No. GP-302388-R&D-KM

8

REMARKS

The Office Action of May 9, 2006 has been received and carefully reviewed. It is submitted that, by this Amendment, all bases of rejection are traversed and overcome. Upon entry of this Amendment, claims 1, 2, 4, 5, 7, 9-22, 25-35 and 42-45 remain in the application. Claims 3, 6 and 36-41 have been cancelled herein without prejudice. Claims 27-35 are withdrawn as being directed to a non-elected species. Reconsideration of the claims is respectfully requested.

Applicants respectfully submit that claim 15 is an allowable generic claim, and that claim 27 (directed to a withdrawn species) and those claims depending ultimately therefrom should be considered allowable. As such, it is submitted that currently withdrawn claims 27-35 are entitled to consideration.

Claims 42-45 stand rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The Examiner contends that the specification as filed does not support more than one ceramic or metallic layer.

Applicants respectfully disagree with the Examiner's contention that the specification as filed does not support more than one ceramic or metallic layer. Support for these recitations may be found in the specification as filed, at least at paragraphs [0013], [0032] and [0033]. Specifically, paragraph [0013] states in part that, "an interfacial composite laminate, comprising at least one ceramic interfacial layer ... and at least one metallic interfacial layer..." As such, the Applicants submit that the rejection based upon 35 U.S.C. 112, first paragraph, is erroneously based, and withdrawal of the same is requested.

Claims 2, 5, 16, 18 and 19 stand rejected under 35 U.S.C. 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Examiner states that it is unclear where the third and alumina layers are located in relationship to the substrate, ceramic and metallic layers.

Applicants have amended claims 2, 5 and 16 to further clarify the location of the third layer. Applicants submit that claims 18 and 19, as amended in the preliminary amendment filed February 22, 2006, recite that the third layer and the alumina layer, respectively, are disposed between the

Appln. S.N. 10/673,762
Amdt. dated August 9, 2006
Reply to Office Action of May 9, 2006
Docket No. GP-302388-R&D-KM

9

substrate and the carbide-rich coating. Applicants have amended claims 18 and 19 herein to further clarify that third layer and the alumina layer, respectively, are disposed between the substrate and the ceramic layer. As such, the Applicants submit that the rejection of the claims based upon 35 U.S.C. 112, second paragraph has been traversed and overcome.

Claims 1-7, 9-22, 25 and 26 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Dearnaley et al. (U.S. Patent No. 6,087,025). Claims 1-7, 9, 15-22, 25 and 26 stand rejected as being anticipated by Welty et al. (U.S. Patent No. 6,904,935). The Examiner states that the '025 patent clearly includes a metal carbide layer formed between diamond-like carbon and the additional layer, and thus provides for the instant invention. The Examiner states that the '935 patent discloses a diamond-like layer on a substrate having the claimed intermediate layers thereon. In response to the Applicants' arguments filed on February 22, 2006, the Examiner states that since the amount of crystallinity in the claimed diamond has not been defined, it can include diamond-like coatings as recited in the references.

Applicants respectfully disagree with the Examiner's assertion that the pending claims (which do not explicitly recite the amount of crystallinity in the diamond) include diamond-like coatings. As illustrated in the Applicants' remarks filed on February 22, 2006, diamond is **not** the same as diamond-like carbon or as amorphous diamond. Furthermore, Applicants clearly recite a diamond coating, **NOT** a diamond-like coating or an amorphous diamond coating. In sharp contrast, when Applicants were discussing a diamond-like coating to fill in surface roughness that may exist on the diamond coating (see specification as filed at paragraph [0017]), Applicants clearly distinguished between "diamond-like" and "diamond."

It is submitted that one skilled in the art would be cognizant of the fact that a diamond is polycrystalline, with essentially 100% of sp³ bonded atoms, with clearly defined grains and grain boundaries. It is further submitted that one skilled in the art would also be cognizant of the fact that diamond-like carbon films are comprised of amorphous carbon-hydrogen bonds (a-C:H), and that no grains and no grain boundaries are detectable (See, C. Venkatraman, C. Brodbeck and R. Lei, "Tribological properties of diamond-like nanocomposite coatings at high

Appl. S.N. 10/673,762
Amdt. dated August 9, 2006
Reply to Office Action of May 9, 2006
Docket No. GP-302388-R&D-KM

10

temperatures", Surface and Coatings Technology, Volume 115, Issues 2-3, 18 July 1999, Pages 215-221; a Web copy of which is submitted herewith for the Examiner's convenience).

According to J. Robertson ("Diamond-like Amorphous Carbon", Materials Science and Engineering: R: Reports, Volume 37, Issues 4-6, 24 May 2002, Pages 129-281; Abstract submitted herewith for the Examiner's convenience), "diamond-like carbon (DLC) is a metastable form of amorphous carbon containing a significant fraction of sp^3 bonds. It can have a high mechanical hardness, chemical inertness, optical transparency, and it is a wide band gap semiconductor ... DLC has some extreme properties similar to diamond, such as the hardness, elastic modulus and chemical inertness, but these are achieved in an isotropic disordered thin film with no grain boundaries...."

The table attached as Exhibit 1 (taken from Karl-Heinz Habig, "Fundamentals of the tribological behavior of diamond, diamond-like carbon and cubic boron nitride coatings", Surface and Coatings Technology, 76-77 (1995) 540-547) further illustrates the differences between the properties of diamond and diamond-like carbon. As depicted, the chemical composition of diamond includes greater than 99% carbon, while the chemical composition of diamond-like carbon may include 20-50 atomic percent hydrogen, 0-35 atomic % metals (Fe, W, Ta, Ti, Si, Cr...), and a balance of carbon. Diamond has a lattice structure and sp^3 type bonds, while diamond-like carbon has an amorphous structure and sp^3 , sp^2 , and sp type bonds. The different structures of diamond and diamond-like carbon cause the two materials to wear via different mechanisms. The table also shows that diamond and diamond-like carbon have different hardness values and different temperature stability.

Furthermore, it is submitted that one skilled in the art would be cognizant of the fact that diamond and diamond-like carbon are deposited via different methods. Diamond is established, for example, via chemical vapor deposition; whereas diamond-like carbon is established, for example, via physical vapor deposition. The different deposition techniques for diamond and diamond-like carbon further illustrate the differences between the materials.

As such, it is submitted that one skilled in the art would not be led to the conclusion that the diamond coating of Applicants' claims includes a diamond-like carbon coating or an

Appln. S.N. 10/673,762
Amdt. dated August 9, 2006
Reply to Office Action of May 9, 2006
Docket No. GP-302388-R&D-KM

11

amorphous diamond coating, as they are different compounds from diamond, having different structures and different properties.

For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 1-7, 9-22, 25 and 26 is not anticipated, taught or rendered obvious by the cited references, either alone or in combination, and patentably defines over the art of record.

Claims 1-7, 9-22, 25 and 26 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Drawl et al. (U.S. Patent No. 4,992,082) in view of Deamaley et al. (the '025 patent) or Welty et al. (the '935 patent). The Examiner states that Drawl discloses attaching a diamond or diamond-like coating to a substrate through an interlayer. The Examiner states that the '025 patent or the '935 patent discloses the claimed interlayers. The Examiner concludes that it would have been obvious to have provided the interlayers to attach the carbon coating of the '082 patent to the substrate, as the interlayers of the '025 patent or the '935 patent improve adherence.

Applicants have amended claims 1, 15 and 27 to recite that the diamond layer is contiguous. Support for this recitation may be found throughout the specification as filed, at least at paragraph [0017] and in Figure 1. Paragraph [0017] states that the diamond coating may have roughness valleys between the diamond grains. The formation of "roughness" valleys indicates that the grains are in close enough proximity to each other so as to form a contiguous coating. Figure 1 also shows a contiguous coating.

The Examiner is respectfully reminded that regarding the written description requirement, the courts have held that the subject matter of the later claim need not be described literally or "*in ipsius verbis*" in order for the specification to satisfy the description requirement. See, e.g., *Cordis Corp. v. Medtronic AVE, Inc.*, 339 F.3d 1352 (Fed. Cir.), reh'g denied, 2003 U.S. App. LEXIS 22508 (2003); and *In re Lukach*, 442 F.2d 967, 969, 169 U.S.P.Q. 795, 796 (C.C.P.A. 1971). As such, it is submitted that the support for the recitation of the word "contiguous" may, indeed, be gleaned from the specification and drawings as originally filed and as understood in their totality.

Applicants respectfully submit that the '082 patent teaches the deposition of diamond or diamond-like particles onto the substrate, and then interposing a binding material between and

Appln. S.N. 10/673,762
Amtd. dated August 9, 2006
Reply to Office Action of May 9, 2006
Docket No. GP-302388-R&D-KM

12

on each of such particles (see Col. 3, lines 35-44). The '082 patent goes on to state that "...the binding material extending across the **separated particles...**" (emphasis added, see Col. 3, lines 44-45). Still further, the '082 patent teaches that, "the diamond or diamond-like particles are deposited by a two-stage technique to ensure separation of the particles ... The second stage comprises substantially suppressing nucleation of additional particles before formation of a contiguous film of such particles takes place..." (see Col. 4, lines 24-41). These teachings are in sharp contrast to the contiguous film recited in Applicants' claims.

The Examiner's attention is also drawn to the '082 patent at Col. 3, lines 13-30 which states:

The problems facing developers of industrially-robust diamond coated tools remain. One of these is the nature of the CVD process which requires that the substrate be subjected to a temperature of about 1000°C., which basically eliminates the use of many types of tool substrates and restricts the selection to high temperature resistant substrates that generally are not strong in tension. A second problem involves adherence and mechanical strength of the coating in contact with the supporting substrate. There are very few substrate materials, and almost none commercially, which can tolerate both the high temperatures of the current deposition process as well as provide sufficient mechanical support to sustain the internal stresses which are developed in a **continuous diamond film** due to the exceptionally low coefficient of thermal expansion of diamond and its extremely high modulus of elasticity. (emphasis added).

This passage of the '082 patent clearly *teaches away* from the formation of a continuous diamond film as a coating on a tool, as achieving such a diamond coated tool is described as a problem. In its entirety, the '082 patent teaches 1) a discontinuous diamond layer having a binder material deposited thereon, and 2) that achieving a tool with a continuous diamond layer is a problem. Figures 3 and 4 of the '082 patent further illustrate the separate, discontinuous diamond particles established on the substrate, and having binder layers therebetween and thereon. As such, it is submitted that the '082 patent does not teach or suggest a contiguous diamond coating, such as that recited in Applicants' claims.

Assuming *arguendo* that one skilled in the art would combine the '082 patent with either of the '025 patent or the '935 patent, it is submitted that Applicants' invention as defined in the claims would not be rendered obvious. The '082 patent teaches discontinuous diamond or

Appl. S.N. 10/673,762
Amdt. dated August 9, 2006
Reply to Office Action of May 9, 2006
Docket No. GP-302388-R&D-KM

13

diamond-like coatings. The '025 patent teaches a diamond-like carbon coating, and the '935 patent teaches an amorphous diamond top layer. It is submitted that none of the references, alone or in combination, teach or suggest a contiguous diamond coating.

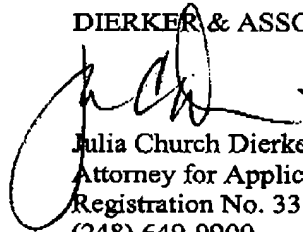
For all the reasons stated above, it is submitted that Applicants' invention as defined in claims 1-7, 9-22, 25 and 26 is not anticipated, taught or rendered obvious by the cited references, either alone or in combination, and patentably defines over the art of record.

In summary, claims 1, 2, 4, 5, 7, 9-22, 25-35 and 42-45 remain in the application. It is submitted that, through this amendment, Applicants' invention as set forth in these claims is in a condition suitable for allowance.

Further and favorable consideration is requested. If the Examiner believes it would expedite prosecution of the above-identified application, the Examiner is cordially invited to contact Applicants' Attorney at the below-listed telephone number.

Respectfully submitted,

DIERKER & ASSOCIATES, P.C.



Julia Church Dierker
Attorney for Applicants
Registration No. 33368
(248) 649-9900
juliad@troypatent.com

3331 W. Big Beaver Rd.
Suite 109
Troy, MI 48084-2813

Dated: August 9, 2006
JCD/JRK/jrk